

REMARKS/ARGUMENTS

Support for amended Claims 8, 11 and 13 is found in Figure 9 and at specification page 22, lines 10-16.

No new matter has been added.

The rejection of Claims 8-23 under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement is traversed.

The present Application discloses a tantalum layer (Ta layer), a Ta<sub>2</sub>C layer and a TaC layer as exemplary compounds of tantalum carbide (see specification page 15, line 10-15). Amended Claims 8, 11 13 recite a limitation that “the tantalum carbide material comprises TaC layers formed by having the carbon penetrate the surface of the tantalum or tantalum alloy; fibrous crystals within the same TaC layer has the same growing direction; and a growing direction of fibrous crystals within a TaC layer is different from a growing direction of fibrous crystals within a different TaC layer.”

As to the limitation, Applicants disclose that:

“FIG. 9 shows the surface enlarged electron photomicrograph of the tantalum carbide of the tantalum carbide manufactured by the above heat treatment condition. Fibrous crystals are folded as shown in FIG. 9. The fibrous crystals grow in the same direction in the same layer, and there is a layer in which the other fibrous crystals grow in the direction different from the growing direction. One crystal structure is produced by the overlapping of the crystals” (see specification page 22, lines 10-16, emphasis added).

Further support for the amendment is found in Figure 9. Figure 9 shows fibrous crystals having the same growing direction within a TaC layer. Figure 9 further shows that a growing direction of fibrous crystals within a TaC layer is different from that of fibrous crystals in a different TaC layer (see Figure 9).

Thus, it is believed that the rejection under 35 U.S.C. 112, first paragraph is obviated by the present Amendment.

The rejection of Claims 8-10, 13-17 and 21-23 under 35 U.S.C. 102(b) as being anticipated by, or in the alternative, rejected under 35 U.S.C. 103(a) as being unpatentable over Douglass et al. (US 3,163, 563), Lopez et al. (US 5,916,377) or Garg et al. (US 5,126,206) is traversed.

Douglass discloses a composite body having a carbide layer. Lopez discloses a method for carburizing a tantalum or tantalum alloy. Garg discloses a coated substrate product having a parent substrate and a polycrystalline diamond layer. However, **none** of the references disclose a tantalum carbide material wherein the tantalum carbide material comprises TaC layers formed by having the carbon penetrate the surface of the tantalum or tantalum alloy; fibrous crystals within the same TaC layer has the same growing direction; and a growing direction of fibrous crystals within a TaC layer is different from a growing direction of fibrous crystals within a different TaC layer as in amended Claims 8, 11 and 13.

The Office asserts that “where the claimed and prior art products are identical or substantially identical in structure or are produced by identical or a substantially identical processes, a *prima facie* case of either anticipation or obviousness will be considered to have been established over functional limitations that stem from the claimed structure” (see Office Action, page 4). However, **none** of the reference disclose a tantalum carbide material obtained by a process where a native oxide layer of  $Ta_2O_5$  formed on a surface of the tantalum or tantalum alloy is sublimated to remove the  $Ta_2O_5$  as in as in amended Claims 8, 11 and 13.

Douglass discloses carburizing tantalum alloys at a pressure of about 20-50 mm. pressure (mmHg) in a methane atmosphere (see Douglass, Col. 3, lines 16-21). Lopez discloses carburizing a tantalum or tantalum alloy at a pressure of 0.10-0.01 torr (see Lopez, Col.4, lines 4-19). Garg discloses coating a substrate at a pressure of 30 torr in a methane

atmosphere (see Garg, Col. 10, lines 46-65). However, none of them disclose removing Ta<sub>2</sub>O<sub>5</sub> layer prior to depositing TaC layers as in amended Claims 8, 11 and 13.

Additionally, the newly submitted declaration demonstrates that a tantalum carbide material does **not necessarily and/or inherently** have TaC layers where fibrous crystals within the same TaC layer have the same growing direction; and a growing direction of fibrous crystals within a TaC layer is different from that of fibrous crystals within a different TaC layer when a native oxide layer of Ta<sub>2</sub>O<sub>5</sub> in the tantalum carbide material is **not** removed prior to depositing the TaC layers. None of the references recognize the importance of removing a Ta<sub>2</sub>O<sub>5</sub> layer prior to depositing the TaC layers to obtain TaC layers having fibrous crystals as in amended Claims 8, 11, and 13.

Furthermore, Applicants disclose that the heat treatment of the tantalum carbide material is carried out in a vacuum environment of 1 Pa or less as in Claim 16. However, the heat treatment processes of the references are carried out in high pressure environments, e.g. 20-50 mmHg (2.6-6.6 kPa) in Douglass, 0.1-0.01 torr (13.3-1.3 Pa) in Lopez and 30 torr (3.9 kPa) in Garg. Thus, the heat treat treatment of the present Application is simply different from those of the references cited.

Therefore, in light of the teachings of Douglass, Lopez and Garg, one of ordinary skill in the art would not have foreseen a tantalum carbide material as in amended Claims 8, 11, and 13.

Withdrawal of the rejection is respectfully requested.

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Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal allowance. An early and favorable action is therefore respectfully requested.

Respectfully submitted,

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